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Pulmonary rehabilitation in the management of rhino-orbito-cerebral mucormycosis infection: A post-covid-19 complication

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ABSTRACT

Mucormycosis, often known as 'black fungus' in India, is a fungal illness that has been identified in COVID-19 patients on an irregular basis. This case report describes a patient who was diagnosed with rhino-orbital-cerebral mucormycosis infection following COVID-19 infection. The COVID-19 infection weakens the patient's immune system, making the patient more susceptible to other fungal infections. He had surgery for this as well as ocular exenteration surgery. A physiotherapy treatment was intended to battle the post-surgery problems, including COVID-19 infection. The goal of the physiotherapy was to improve the patient's facial muscles after surgery. Following recovery from the COVID-19 infection, it also aimed to strengthen the patient's respiratory capacity and increase his exercise tolerance. As a result, the patient's quality of life improves. It included the facial proprioceptive neuromuscular facilitation (PNF) exercise as well as a well-planned cardiovascular exercise programme. The 6-minute walk test, peak expiratory flow rate, and quality of life questionnaire were used to assess the efficacy of the physiotherapy treatment.

Keywords: Mucormycosis, COVID-19, physiotherapy, facial PNF, eye exenteration surgery

1. INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a contagious disease caused by the novel severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2) that has afflicted over 10 million people worldwide (Saldanha et al., 2021). Patients in severe conditions are ten times more likely to develop secondary bacterial or fungal infections than secondary viral infections (Nambiar et al., 2021). Mucormycosis has been documented on an irregular basis in COVID-19 individuals (Saldanha et al., 2021). Even though it is rare, with just 1.8 instances per million people worldwide each year, more incidents were

documented during the COVID-19 illness outbreak (Chavda and Apostolopoulos, 2021). Mucormycosis, commonly known as "black fungus" in India, is a fungal infection caused by moulds of the mucormycetes family, which are ubiquitous by-products of organic material found in soil and trash. *Rhizopus* is the species that has been linked to the bulk of Mucormycosis cases described in the study. It is more common in patients with certain underlying medical conditions, such as immunocompromised patients and diabetic ketoacidosis.

Mucormycosis symptoms vary depending on where the fungus grows within the body. In this case, the two most common types of Mucormycosis are rhino-orbital-cerebral and pulmonary (Nambiar et al., 2021). Early symptoms of Rhino-Orbito-Cerebral Mucormycosis include sinusitis and periorbital cellulitis, as well as eye and facial pain and numbness, followed by blurred vision (Nambiar et al., 2021).

People recovering from COVID-19 are becoming more aware of their rehabilitation needs (Scheiber et al., 2021). This infection can cause fatigue, shortness of breath, palpitations, muscular atrophy, and reduced functional capacity. Cardiopulmonary rehabilitation (CPR) has been shown in trials to improve patients' functional status, quality of life, and prognosis (Tozato et al., 2021). Physical therapists specialise in pulmonary rehabilitation, joint mobility limitations and pain, neurological, sensory, and motor deficit rehabilitation, fundamental health retraining, ADL preparation, and electrotherapy (Scheiber et al., 2021).

2. PATIENT INFORMATION

A 52-year-old male patient, a known instance of COVID-19, presented to the hospital complaining of slurred speech and jaw pain. He tested positive for COVID-19 five months ago and was treated for two months at the same institution. He is also an elderly CVE (cerebrovascular event) patient with cavernous sinus thrombosis, post-operative Rhino-Orbito-Cerebral mucormycosis, and Post-COVID-19 condition. For that patient, orbital exenteration of the right eye was performed under anaesthesia.

3. CLINICAL FINDINGS

The clinical evaluation began with the patient's full consent. During the examination, the patient was alert, cooperative, and aware of time, place, and person. The patient was sitting with a forward slouching posture with a mesomorphic body type. Slurring of speech was observed, and the patient's mouth angle deviated to the right. The patient was a febrile when palpated. The pain was increased by talking, chewing, and jaw motions, and it was reduced by rest and medications.

Timeline

The timeline of the patient during the hospital stay has shown in Table 1.

Table 1 The timeline of the patient during hospital stays.

| | |
|--------------------------------|------------|
| Date of admission | 07/01/2022 |
| Date of surgery | 09/01/2022 |
| Date of physiotherapy referral | 12/01/2022 |
| Date of discharge | 26/02/2022 |
| Date of the last follow-up | 10/03/2022 |

Diagnostic assessment

Chest X-ray findings shows heterogeneous opacities in bilateral lung fields (Figure 1). Magnetic resonance imaging revealed rhino-orbital mucormycosis with right frontal lobe abscess. Pre rehabilitation outcome measures were assessed which includes Peak expiratory flow rate (PEFR):180L/min, to assess functional capacity 6-minute walk test was done and the patient was able to perform 100m with 1 pause, WHO-Quality of life questionnaire (72/100) was used to assess the quality of life.



Figure 1 Chest X-ray showing heterogeneous opacities in bilateral lung fields.



Figure 2 Dressing present over surgical site (right eye) (A). Patient is performing lower extremity (B) and Upper extremity (C) active mobility exercise. Patient is performing Thoracic expansion exercise (D).

Therapeutic intervention

The physiotherapy management intended to improve the patient's post-surgery facial muscular mobility. It also attempted to improve the patient's respiratory capacity and boost the patient's exercise tolerance following recovery from the COVID-19 infection. As a result, the patient's quality of life improves. The physiotherapy treatment began with the patient being educated about his illness, the importance of physiotherapy in his condition, and what care must be taken to avoid problems. The major goal of the treatment was to correct the patient's posture. Good placement helps to reduce pressure sores, facilitates secretion drainage, and improves air circulation. At least three times every day, for at least 10 minutes, the semi-fowler position (45 to 60 degrees) was suggested. Because it promotes oxygen binding, the prone position was employed twice a day. The patient and his family were

made aware of the value and necessity of exercise. Breathing exercises such as breathing control, thoracic expansion, segmental breathing, and diaphragmatic breathing were taught along with active mobility training of both upper and lower extremities. (Figure 2). To avoid the aggravating effect of training, the patient's activity frequency was strictly limited. The patient was taught dyspnoea-relieving poses and Jacobson's relaxation technique. It evolved to aerobic workouts such as walking, jogging, and so on. In addition to their frequency, intensity, duration, and type of exercise, the patient was adequately discussed and depicted. Psychological counselling and a follow-up programme were also part of the rehabilitative treatment. The entire intended comprehensive regimen, as well as its dose, is detailed in Table 2.

Table 2 Physiotherapy management

| S.No. | Goals | Interventions | Plan of Care (FITT) |
|-------|--|--|---|
| 1. | Patient Education | Educate patient about disease condition and teach possible precautions. psychological counselling | Hand-outs and verbal instructions |
| 2. | Reduce oedema & Swelling | 1- Icing 2- Active Exercises | Icing for 2min x 5 strokes BD x QD Active exercises 10 rep x 1 set BD x QD |
| 3. | Facial muscle movement and strengthening | Facial PNF exercises | 2 times daily from 2 nd postoperative day |
| 4. | Patient positioning | Semi-fowler position Prone lying | Semi-fowler- 3 x 10 mins/day Prone lying- 2 x30mins x QD |
| 5. | Relieve dyspnoea | Dyspnoea relieving positions | 10-15 min whenever patients feel dyspnoea |
| 6. | Improve ventilation | Breathing exercises- pursed-lip respiration, segmental breathing, and diaphragmatic breathing | 2 sets of each exercise – BD x QD |
| 7. | Improve exercise tolerance | Aerobic exercise program | Walking for 15 min 2 times daily progressing to stair climbing |
| 8. | Follow up | Home exercise program Energy conservation techniques | For a week at home followed by follow up assessment |

Follow-up and outcome

The patient received two weeks of PT management, as well as a two-week home exercise programme, followed by a follow-up. The patient was evaluated before beginning therapy, after 2 weeks, at the time of discharge, and again at the time of follow-up (Table 3).

Table 3 Follow up and Outcome

| Outcome measures | Pre-treatment | At discharge | At follow-up |
|---------------------|-------------------|--------------------|-------------------|
| 6 min walk distance | 100m with 1 pause | 180m with 2 pauses | 250m with 1 pause |
| PEFR | 180L/min | 220L/min | 250L/min |
| WHO-QOL | 72/100 | 80/100 | 85/100 |

4. DISCUSSION

The current new coronavirus risk has put the human population in jeopardy. Not only are people with comorbid diseases more prone to have COVID-19, but people who don't have concomitant conditions can also get it. According to studies, a prolonged ICU stay causes acquired weakness and has a mental impact on the patient (Bhakaney et al., 2021). Chronic respiratory diseases are associated with reduced functional capabilities, poor sleep quality, and a healthy mental state. It has been revealed that COVID-19 patients' therapy and rehabilitation are being hampered by a black fungus known as mucormycosis (Kr, 2021). A comprehensive

pulmonary rehabilitation programme combats the long-term health implications of chronic respiratory illnesses effectively. The basic therapies used to rehabilitate persons whose health has deteriorated owing to respiratory difficulties are patient education, breathing methods, and an incremental exercise training programme.

The physical therapy was divided into two parts, one focusing on relieving the patient's mucormycosis symptoms and the other on addressing the pulmonary limitations caused by a previous episode of COVID-19 infection. Post-op face oedema from mucormycosis infection was reduced by icing and exercising, followed by facial muscle strengthening exercises. Facial PNF exercises are effective in strengthening facial muscles. Anaerobic exercise programme based on the FITTs principle was designed and implemented to improve the patient's exercise tolerance (Pathan et al., 2021). The changes were measured and documented on the outcome measures after a 2-week treatment period and a 2-week follow-up period.

5. CONCLUSION

The combined treatment planned for the patient with mucormycosis after COVID-19 was shown to be quite helpful in improving the patient's health. A brief period of modified pulmonary rehabilitation was found to be extremely useful in terms of improving general functional performance and quality of life.

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Author Contributions: Details of contribution of each authors regards manuscript work & production.

Informed consent

Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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